

THE MINERAL INDUSTRY OF

RUSSIA

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Russia occupies more than 75% of the territory of the former Soviet Union (FSU) and accordingly inherited a large percentage of its mineral resources. Russia is a large mineral producer, accounting for a large percentage of the FSU's production of a range of mineral products, including aluminum, bauxite, cobalt, coal, diamonds, mica, natural gas, nickel, oil, platinum-group metals, tin and a host of other metals, industrial minerals, and fuels.

Still, significant mineral deposits are located in other former republics. Russia had been significantly or entirely dependent on the output of other FSU countries for certain minerals, particularly metals from Central Asia, the Caucasus, and Ukraine. For example, Russia had to import almost all of its needs for antimony metal, chromite, manganese, mercury, and titanium and zirconium raw materials from other FSU countries. For other minerals such as alumina, copper, lead, molybdenum, and zinc, a large percentage of the production had come from other former republics. The other republics, in turn, were significantly dependent on Russia for a large percentage of their minerals, and, in particular, oil and gas, for which Russian supplies were critical. While these interdependencies were often lessened by the sharp fall in domestic consumption of practically all mineral commodities following the breakup of the Soviet Union, they nevertheless remained crucial for a number of industries.

Russia's dependencies on the other FSU countries continued in 1995. In response, Russia was attempting to develop its own domestic industries for a number of those mineral commodities that it was importing from the FSU countries. The striving to lessen dependence on FSU countries was based not only on old autarkik thinking, but also on concerns about the reliability of these new countries to be suppliers of essential raw materials.

In turn, Russia was exporting much of its mineral output to world markets rather than to the FSU both owing to the fall in domestic consumption in the FSU and Russia's need to earn hard currency. In cases where Russia was still exporting minerals to other FSU countries, it was at times incurring heavy debt from nonpayment as was the case with natural gas shipments.

The Russian economy appeared to have stopped its rapid decline in 1995 with the decrease in the gross domestic product having dropped by only 4% in comparison with that of 1994 while in 1994 this drop was 13%. In 1995,

production in the minerals sector also appeared not only to have ceased falling, but to have begun to increase. The reported output of most metals and industrial minerals increased while production of mineral fuels was near the 1994 level, which was in sharp contrast to the previous 3 years when output of practically all minerals fell precipitously.

Metals output, however, was still far below capacity with capacity utilization highest in the production of aluminum, iron ore, and pig iron where it ranged between 76% to 92%, followed by steel and rolled products with about 65%, nonferrous metals production with about 60%, and steel pipe production with about 33%. The underutilization of capacity was increasing the cost of metal production, causing enterprises to spend proportionally higher amounts for energy and transport per unit of output.

Environmental Issues

In 1995, according to an article published in the Russian journal *Tsvetnye Metally* (Nonferrous Metals), August 1996, pp. 69-71, Russia's metallurgical industry was responsible for 24% of the country's pollution caused by harmful emissions into the atmosphere from stationary sources. In 1995, however, the quantity of harmful emissions released into the atmosphere by metallurgical enterprises decreased by 10% compared with that of 1994. Reportedly, Russian metallurgical enterprises averaged a 66% rate of removal of harmful substances from atmospheric emissions.

Much of the problem with pollution from metallurgical enterprises, according to this article in *Tsvetnye Metally*, was attributed to the fact that during the Soviet period practically all emphasis was placed on increasing production with inadequate investment made in pollution control devices and other pollution abatement measures. This problem has been greatly aggravated by the lack of funds for renovating deteriorating capital stock at metallurgical enterprises as well as by a breakdown in following production procedures necessary for containing pollution.

While during the Soviet period from about 2% to 7% of capital investment in metallurgy was devoted to pollution abatement, in the switch over to a market economy system this percentage has been reduced to almost nothing. The percentage of capital expenditure actually necessary to adequately prevent air, water, and soil pollution at

metallurgical enterprises was estimated to be between 30% to 35% of total capital investment. This percentage does not include funds necessary to restore already damaged aspects of the environment which would greatly increase this expenditure.

In a list of 65 priority cities and industrial centers in need of pollution abatement compiled by the State Committee for Hydrometeorology, 33 of these contained ferrous and nonferrous metallurgical enterprises. These metal processing industries generally were responsible for from 50% to 90% of the pollution in these priority areas. The worst offenders were the Norilsk mining and metallurgical complex with enterprises in East Siberia and on the Kola Peninsula that mines and processes mixed sulfide ores containing nickel, copper, and a large number of byproduct metals; and the Kuznetsk, West Siberian, Magnitogorsk, Cherepovets, Novolipetsk, and Nizhny Tagil steel mills.

The Norilsk complex was responsible for 8% of all harmful atmospheric emissions in Russia in 1995. At enterprises of the Norilsk complex located on the Kola Peninsula, which borders Scandinavian countries, the level of emissions had decreased by more than 26% compared with that of 1980. This was in accord with a transnational effort to lower the level of emissions crossing national borders. Pollution from Norilsk's enterprises on the Kola Peninsula was a matter of serious concern in neighboring Scandinavian countries. However, further reductions of atmospheric emissions from Norilsk's metallurgical enterprises on the Kola Peninsula were not deemed feasible without major renovations.

In 1995, reportedly, the volume of polluted water emitted by metallurgical enterprises decreased compared with that of 1994, although the volume of water consumption remained the same. The main sources of water pollution were many of the above named steel mills. These steel mills lacked adequate water purification facilities; and, furthermore, these facilities were often overloaded, improperly used, and in need of repair. Contaminated water emitted from enterprises of the Norilsk complex in both East Siberia and on the Kola Peninsula were major sources of water pollution in the Kara and Barents Seas.

Production

In a major change since the Soviet period, in 1995 Russia began publishing mineral production and trade data, some of which had not been available for more than fifty years. Then, in November 1995, a decree was issued which again made secret the disclosure of certain mineral production data. It must be added that even when figures were reported, at times contradictory production and trade numbers would be reported by seemingly authoritative sources. Therefore, reported numbers that appear in this report may be at variance with other published numbers, but in general the order of magnitude for the differences in reported numbers is

small.

In 1995 compared with that of 1994, production increases were reported for most ferrous and nonferrous metals and for mineral fertilizers and industrial minerals, while production reportedly remained near the same level or fell slightly for fuel minerals.

Despite the increase in Russian metal production in 1995, the Chairman of the Russian Committee for Metallurgy stated that the minerals industry, which was primarily export-oriented, experienced severe economic strains because of the ruble trading band imposed in July 1995. This band established a fixed trading range for the ruble versus the dollar. This increased production costs because domestic prices in rubles for production inputs and transport could rise with inflation since they had not been kept within any band. But with ruble cost of production increasing with inflation, metals exporters were not able to earn additional rubles for their exports because the ruble had to trade within a limited exchange rate band, constraining the fall in the ruble and limiting the amount of rubles that the traders could receive for the foreign currency earned.

Trade

The increase in metals output was reflected in increased exports, while domestic metal consumption remained at the previous year's level. For Russia, limited export figures from January through October 1995 show that there was an increase in exports of practically all metals in terms of physical volume. Despite Russia's increased exports in 1995, the Russian Metallurgy Committee reported that export earnings were restricted because of the ruble trading band established in July 1995.

Along with apparently official exports, a significant amount of metals was unofficially exported in violation of Russian customs laws. In 1995, nonferrous metals comprised the largest category in value of goods being taken out of the country that had been intercepted by Russian customs agents.

An important form of mineral trade involved toll smelting and refining of metals, which allowed Russian metallurgical enterprises to stay in operation despite a shortage of working capital, low domestic demand, and low demand in traditional FSU markets. Tolling also could be more profitable than processing domestic materials to export as tolled material was exported duty free. Barter trade was still widespread in the domestic metals sector, accounting for 55% of all sales in 1995, which had the adverse affect of causing shortages of money needed to pay workers and expenses.

Commodity Review

Metals

Aluminum.—In 1995, Russia reported a 2% increase in aluminum production compared with 1994. Reported

exports of primary aluminum in 1995 of 2.19 million metric tons (Mt) were the same as 1994 exports. Of total 1995 exports, 1.78 Mt were from toll smelted raw materials. Production of bauxite and alumina in 1995 reportedly increased by 3% and 15% respectively compared with that of 1994.

Russia, according to preliminary data, in 1995, reported importing 2,681,800 metric tons (t) of aluminum ores and concentrates, of which 1,601,400 t came from the countries outside the FSU and 1,080,400 t came from the FSU. Tolling arrangements for several years had been of major importance in aluminum production and trade. In 1993, tolled output comprised 47% of total output; in 1994, 63%; and in 1995, 65%.

The international Memorandum of Understanding (MOU), initially put into place between the European Union and the Governments of Australia, Canada, Norway, Russia, and the United States because of an oversupply of aluminum on world markets, continued in force through 1995, but ceased its functioning in early 1996.

The aluminum industry is the only Russian metals industry which has been able to maintain production at almost peak levels since the breakup of the Soviet Union. This was accomplished despite the fact that the Russian aluminum industry during the Soviet period was over 50% dependent on imported raw materials. In the case of the Russian aluminum industry, production was maintained by large exports to world markets and by control of a significant portion of the Russian aluminum industry passing into the hands of foreign investors and traders. In this manner, the Russian aluminum industry has been assured of timely supplies of raw materials and working capital. Foreign control, however, has not had as benign an effect on the Russian and other FSU bauxite and alumina industries. These industries lost a large percentage of their customer base as the foreign firms controlling the Russian aluminum industry have had the Russian smelters toll smelt a larger percentage of imported raw materials rather than purchase Russian and other FSU raw materials.

Antimony.—Russia is in the process of developing its own antimony metal-producing facilities. All antimony metal in the FSU was produced at the Kadamzhay plant in Kyrgyzstan with much of the antimony raw material coming from Russia's Sakha/Yakut Republic. Production of antimony metal was scheduled to begin in 1996 at the Yuzhuralnikel plant in the southern Urals, which was extending its production profile from nickel to antimony and other metals. Plans called for Yuzhuralnikel to produce 3,000 metric tons per year (t/yr) of antimony, and plans call for construction of two other antimony metal production facilities in Russia.

Copper.—In 1995, refined copper production reportedly increased by 15% compared with that of 1994. The upturn in refined copper production was fueled primarily by the export market and by tolling arrangements because there was

little revival of domestic demand. Copper exports increased significantly between 1993 and 1994 with copper exports reported at 164,000 t in 1993 and 470,000 t in 1994. In 1995, copper exports decreased slightly to 464,000 t.

Russia's two main copper-producing regions are the Norilsk complex in East Siberia, which extracts over 60% of the total copper mine output, and the Urals region, which mines about 30% of the total.

Ferroalloys.—Production of ferroalloys in Russia had fallen by about 50% from 1990 levels of output, with particularly sharp declines in the production of lightweight ferroalloys such as ferrotitanium and ferrovanadium. Russia, however, was adequately supplying the countries of the FSU with lightweight ferroalloys because consumption of these ferroalloys also had fallen sharply.

Ferroalloys in the Russia were produced at specialized plants in Russia in Chelyabinsk, Dvurechensk, Kosaya Gora, Lipetsk, Novokuznetsk, Tula, and Serov. Russia produced about one third of the FSU's ferroalloys including about one-third of the FSU's ferrosilicon, more than 50% of its chrome alloys, and almost 15% of its manganese alloys. A number of ferroalloys including ferromolybdenum, ferrotungsten, and ferrovanadium were only produced in Russia. Russia was heavily dependent on imports of alloying material including manganese and chromite, which it imported mainly from other countries of the FSU. In 1995, the Russian ferrochrome industry, which had in previous years received almost all of its chromite raw material from Kazakhstan, experienced extreme shortages of chromite when in the second half of 1995 the Japan Chrome Corporation, the new managers of the Kazakhstan chromite industry, cut off shipments of chromite to Russia and instead directed their exports to world markets.

Gold.—According to The Russian Committee for Precious Metals and Stones (Roskomdragmet), in 1995, Russia produced 132.17 t of gold, of which 19.8 t was byproduct and secondary gold. Russia's independent prospecting artels mined 68.5 t of this total. Magadan Oblast and the Chukotka Peninsula, which had been the FSU's largest gold-producing region, producing between 120 to 130 t of gold in the late 1980's, in 1995, produced only slightly more than 24 t of gold, representing a 30% decrease in gold production compared with that of 1994. The policy of maintaining the exchange rate trading band for the ruble, it was claimed, was making gold mining unprofitable. All gold-mining and beneficiation enterprises in Magadan oblast reportedly operated at a loss in 1995, with the small enterprises and artels barely surviving.

In October 1995, the Chairman of the Russian Committee for Precious Metals and Stones (Roskomdragmet) stated that Russia's gold reserves were about 350 t with the majority of these reserves held by the Central Bank of Russia; Roskomdragmet also was holding a considerable amount. This reserve number reported in October by Roskomdragmet was 40 t higher than the number it reported in June 1995,

indicating apparently that reserves were increasing.

The main producer of gold jewelry in Russia is the Yuvelierprom jewelry manufacturing and trading company. It produced 90% of all Russia's gold jewelry, 60% of its silver jewelry, and also cut and polished diamonds and made diamond jewelry. Jewelry consumption had fallen sharply in Russia since the breakup of the Soviet Union. It also had fallen sharply in the main export markets for Russian jewelry in the FSU. This fall in consumption continued in 1995 with jewelry markets in other FSU countries having practically disappeared.

Iron and Steel.—Production of crude steel in 1995 reportedly increased by more than 5% compared with that of 1994. Production of pig iron in 1995 also increased by about 10% compared with that of 1994. Approximately 60% of Russian steel output was exported in 1995. In 1995, more than 5 Mt of steel was toll produced in arrangements termed internal tolling whereby foreign firms purchased the raw materials for steelmaking in Russia and then shipped these raw materials to Russian steel mills to be toll smelted.

Foreign investment in the Russian steel sector has been quite limited despite Russia's entreaties for foreign investors to take advantage of the country's cheaper labor, underdeveloped domestic market, and large supply of steelmaking raw materials. Russia was trying to improve the attractiveness of investing in the steel sector by declaring tax holidays and exemptions from duties on imported equipment. The primary need was to modernize the steel industry. By modernizing its steel industry to produce higher quality steel, it is envisaged that Russia both would stimulate domestic demand and make Russian steel more saleable on world markets. A number of Western firms including Germany's Mannesman Demag AG and Thyssen AG, Austria's Voest-Alpine AG, Italy's Danieli SpA, and the United Kingdom's Davy International were supplying equipment to modernize Russia's steel industry.

Iron Ore.—In 1995, Russia reported a 7% increase in iron ore production compared with that of 1994. In 1995, Russian iron ore exports increased by 1.6% compared with that of 1994 to 14.25 Mt, of which 11.18 Mt went to countries outside the Commonwealth of Independent States (CIS). Production increases were reported at Russia's three major iron-ore-mining complexes, the Mikhailovka, Lebedi, and Stoilo, which are all in the Kursk Magnetic Anomaly (KMA).

Lead-zinc.—In 1995, production of lead, including secondary lead, reportedly fell by 6% compared with that of 1994. Russia reported producing 28,400 t of lead in 1994 including 15,700 t from concentrates and 12,700 t from scrap. Primary zinc metal production in 1995 reportedly increased by 21% compared with the 1994 level. In 1994, Russia reported producing 137,800 t of zinc from concentrates. Russia was both a lead and zinc importer and exporter, with imports in 1994 of 74,200 t of refined lead and 107,300 t of zinc metal and exports of 14,000 t of

refined lead, 26,100 t of zinc in concentrate, and 88,100 t of zinc metal. All of Russia's lead and zinc imports came from the CIS, primarily Kazakstan and Uzbekistan. In 1995, Russia planned to export 82,000 t of zinc metal.

Russia's lead-zinc mining complexes include the Dalpolimet complex in the Russian Far East, the Nerchinsk complex in the trans-Baikal region, the Salair and Altay complexes in Western Siberia in the Kemerovo and Altay regions respectively, and the Sadon complex in Severo-Ossetiya. There are a number of copper-zinc mining complexes in the Urals. A portion of the lead and zinc concentrates were sent to Kazakstan and Uzbekistan for metallurgical processing.

Most of Russia's lead-zinc deposits were being depleted, and increased production will have to come primarily from finding and developing new fields. A number of new fields were under development. These included the Ozernoye lead-zinc field in northern Buryatiya 140 kilometers north of the Trans-Siberian Railroad, the Goryevskoye lead-zinc deposit in the Krasnodar region of the North Caucasus, and several deposits in the Altay region. New metallurgical plants will have to be built and older ones expanded to process raw material from these new deposits.

Magnesium.—According to information presented at the International Magnesium Association conference in Yamaguchi, Japan, June 2-4, 1996 in a paper entitled "Magnesium Industry in Russia", by Pavel G. Detko and Adrey B. Kudlay, who are employed by the Solikamsk magnesium plant in Russia, in Russia, magnesium is produced at the Avisma titanium-magnesium plant and at the Solikamsk magnesium plant, both in the Urals. Magnesium production in Russia as well as the rest of the FSU, with one exception in Ukraine, is based on carnallite from the Verkhne Kamsk carnallite deposit in the Urals. Part of the magnesium produced is used in titanium sponge production and the other part sold as magnesium. There were five plants in the Soviet Union producing magnesium with two in Russia, two in Ukraine and one in Kazakstan. Peak magnesium production during the Soviet period was 160,000 t/yr with 65,000 t of this total for sale as magnesium and 95,000 t used for titanium sponge production. Russia had produced almost two-thirds of the magnesium for sale in the FSU, Ukraine more than 25%, with the remainder from Kazakstan.

Russia reportedly increased magnesium for sale production in 1995 by 5.9% compared with that of 1994. Production of magnesium alloys, however, dropped precipitously from 15,000 t in 1991 to 2,000 t in 1995 owing to the fall in consumption in the FSU.

At the Solikamsk plant, (Russia's oldest, brought on stream in 1936), primary magnesium output has remained at the 16,500 t/yr to 17,000 t/yr level for the past 15 years with future output expected to remain at this level. The plant also produces about 5,000 t/yr of secondary magnesium.

The Avisma titanium-magnesium plant was put on-stream in 1943 and is also supplied by carnallite from the Verkhne

Kamsk deposit. Although magnesium output for sale at Avisma had fallen from 22,000 t/yr in the late 1980's to between 13,000 t/yr and 14,000 t/yr in 1993, by 1995, magnesium for sale output at Avisma had increased to 20,000 t.

In 1995, Russia remained a major magnesium exporter to world markets.

Nickel.—According to estimates of the International Nickel Study Group, in 1995, Russia produced 201,900 t of primary nickel compared with reported production of 180,900 t of primary nickel in 1994. Output from the Norilsk mining and metallurgical complex in East Siberia, Russia's major producer of nickel, reportedly increased by 11% in 1995 compared with that of 1994. Nickel exports in 1995 reportedly increased by 35.8% compared with that of 1994 to over 155,000 t.

In December 1995, Russia's Oneximbank acquired a 51% stake in the voting shares of the Norilsk enterprises through a Government loan for shares program. The Oneximbank received these shares from the Russian Government for a \$170.1 million loan when the Russian Government did not repay the Oneximbank. The acquisition of these shares was being contested in court by Norilsk's management.

The Finnish mining company Outokumpu held a 50% share in two exploration companies exploring nickel reserves of the Lake Lovno deposit on the Kola Peninsula and of the Kivi-Yarvi deposit in Karelia. Although exploration at Lake Lovno has confirmed nickel reserves, reportedly it is not yet certain whether the quantity of reserves in these deposits would justify development.

Platinum Group Metals.—The increase in nickel production in 1995 resulted in an increase in output of platinum group metals, which are a byproduct of nickel production at Norilsk in East Siberia. With the increase in output there was an increase in exports. According to reported estimates by Johnson Matthey, 1995 platinum sales could reach 1.2 million troy ounces compared with 1.01 million troy ounces in 1994; palladium sales could reach 4 million troy ounces compared with 3.3 million troy ounces in 1994, and rhodium sales would remain at 80,000 troy ounces. Although some of these increases in sales came from increased production, it is probable that a large portion also came from stockpiled material.

Silver.—Silver was primarily produced either at gold-mining enterprises as a coproduct or as a byproduct of nonferrous ores. Russia had one major hard rock silver-mining operation, the Dukat Mine in Magadan Oblast in the Russian Far East, that produced silver and gold. The Dukat silver mine, which contains more than 60% of Russia's silver reserves, was experiencing serious financial difficulties in 1995. Discussions were occurring concerning the sale of the mine or its possible bankruptcy. In 1995, silver concentrates from Dukat were sent for smelting to Canada's Cominco Ltd. in British Columbia where they were processed to blister and then sent to Japan for refining. The

Dukat Mine had planned to send 30,000 t of concentrate to Cominco in 1995, but sent only about 12,000 t. Cominco received an additional 1,500 t of silver concentrate for processing from the Karamken mining complex, also in Magadan Oblast.

Tin.—Tin mine production and tin consumption in Russia had fallen sharply since the breakup of the Soviet Union. Production of refined tin was estimated again to have decreased in 1995 to 9,500 t compared with 11,500 t in 1994 and 13,400 t in 1993. It is estimated that Russia toll refined about 500 t of tin in 1995, more than 1,000 t in 1994, and about 300 t in 1993. During the 1980's, the FSU imported on average 10,000 to 12,000 t/yr of pig tin for refining at Novosibirsk and about 1,500 t/yr of tin in concentrate. Tin imports ceased in 1991. Russia, in the 1990's, switched from being a net importer to being a net exporter of tin, exporting 4,000 t in 1993 and 7,500 t in 1994. Russia was planning to export 5,300 t in 1995.

Tin mining was centered in the Russian Far East in the Chita, Khabarovsk, Magadan, Maritime, and Yakut-Sakha regions. Russia's major tin smelter was at Novosibirsk in East Siberia. There was a smaller smelter at Ryazan that produced solders, babbets, and various tin products as well as tin. In 1995, 11 Russian tin mining and beneficiation plants had stopped producing, among which were the Pevek and Iultin. Only four complexes remained mining tin, the Deputatskiy in the Yakut-Sakha Republic, the Solnechnyy in Khabarovsk Kray, the Khrustalnyy in the Maritime region, and the Khingan complex in the Birobidzhan Jewish Autonomous Kray of Khabarovsk Kray. All the remaining operating complexes except Solnechnyy reported significantly reduced production. All of the tin mining complexes except Khrustalnyy reportedly had adequate reserves for several decades except Khrustalnyy that had reserves adequate for only 5 to 6 more years.

Titanium.—The Avisma titanium-magnesium complex, which is Russia's only producer of titanium sponge, reported that titanium sponge output in 1995 approximately doubled compared with that of 1994 to 39,000 t. Because of a large increase in demand for titanium dioxide, which in the FSU was practically all produced in Ukraine, Avisma was planning to establish a new division for titanium dioxide production.

Ukraine was the only supplier of titanium ore for the titanium industries of the FSU, which are located in Russia, Kazakhstan, and Ukraine. Russia was striving to develop its own titanium ore deposits to eliminate its import dependence on Ukrainian raw material. It appears that Russia is interested in developing deposits that could be suitable for either metals or pigment production. Russia currently has no significant domestic titanium pigment production and wants to develop this capacity.

Tungsten.—Tungsten production in Russia recovered significantly in 1995, with production of tungsten concentrate reportedly increasing by 34.7% compared with

that of 1994. Furthermore, Russia reportedly supplemented tungsten exports through the sale of large amounts of tungsten concentrate from the state reserve.

Russia's largest producer of tungsten, the Tyrnyauz tungsten and molybdenum complex in the Kabardino-Balkaria Republic in the North Caucasus, reportedly had proven commercial tungsten reserves of 374.1 Mt of ore in categories A+B+C₁, 264.1 Mt of which were suitable for underground mining and 110 Mt suitable for surface development.

Despite large reserves, the ore grades at Tyrnyauz were considerably lower than at foreign operations. Plans for 1995 and 1996 called for more selective mining of higher grade ores to increase profitability. Therefore, plans called for concentrating on developing these ores from underground mines and not engaging in open pit mining. Plans called for Tyrnyauz to extract 2.2 Mt of ore in 1995, which would be a fourfold drop in ore extraction. Concentrate production at Tyrnyauz was expected to remain at the previous year's level owing to the mining of higher grade ores. In 1996, plans called for mining ore with a tungsten content of 0.19% and a molybdenum content of 0.035%. All concentrate was shipped for processing to the Nalchik metallurgical plant, 80 km from Tyrnyauz.

A shutdown was reported from October 30 to yearend at the Primorye tungsten mining operation in the Primorye region of the Russian Far East owing to difficulties competing on the domestic market with another tungsten mining operation, the Lermontov tungsten mining complex, also from the Primorye region. Production costs for concentrate at the Primorye complex were reportedly 50% higher than for Lermontov. The Primorye complex reportedly at the time of shutdown had built up 1,700 t of surplus tungsten concentrate stocks. To improve its competitiveness, according to its management, the Primorye complex would require substantial investment.

Industrial Minerals

Cement.—In 1995, Russian cement production reportedly decreased by about 2% compared with that of 1994 after having decreased by about 20% per year between 1991 and 1993 and by more than 25% in 1994 compared with that of 1993. In the years following the break up of the Soviet Union, the Russian cement industry was affected by the fall in FSU consumption, the lack of investment funds, and the fact that cement prices were not increasing as rapidly as fuel and transport costs. This resulted in the shutdown of both production lines and plants. The improvement shown in 1995 was attributed to increased demand in the housing sector. The Russian cement industry was in need of modernization. Almost all Russian cement plants still use wet processing technology, and, because of lack of investment funds, worn out equipment has not been repaired or replaced. Although Russian cement can meet quality

certifications for export, the absence of packing facilities that meet international standards has impeded exports. Privatization and deregulation is fairly far advanced with the industry almost totally deregulated since 1992 and now about 80% privatized. Shares in a number of Russian cement plants are trading on Russian exchanges and foreign investors are beginning to enter the Russian cement market.

Diamonds.—Russia's main diamond mining enterprise, Almazy Rossii-Sakha (ARS), which mines more than 98% of Russia's diamond output in the Yakut-Sakha Republic, is planning to increase diamond production by commissioning the first stage of a mining and beneficiation complex at the Yubeleyniy open pit and by developing the Botuobinskaya pipe.

De Beers Centenary AG had the right to market 95% of total Russian uncut production under a five year agreement due to expire at the end of 1995. Negotiations had commenced with De Beers on the terms of a new agreement.

More than 95% of the production of Russia's diamond cutting industry was exported. ARS was encharged with controlling Russian transactions in rough diamonds. The trading firm Almazjuvelierexport was the only entity legally entitled to export cut diamonds and diamond jewelry.

Magnesite.—Russia's main production center for magnesite is the group of deposits comprising the Satka field in the southern Urals. Production of dead-burned magnesite is based on magnesite from Satka and also on brucite from the Kuldur brucite deposit in the Khabarovsk region near the Transsiberian railroad. Production of dead-burned magnesite occurred at three enterprises: the Magnesite Refractory Production (MRP) joint stock company with a capacity of almost 2 Mt/yr of dead burned magnesite, the Bogdanovich Refractory Production Association with a capacity of over 250,000 t/yr based on brucite, and the small Vnukovsky Refractory Plant in Odintsovo in Moscow Oblast. The magnesite industry has been affected by the decline in steel production. Also, the industry needs to raise the quality of its dead burned magnesite to be competitive on world markets and has to address environmental problems, particularly involving flue dust from rotary kilns at MRP. At MRP, plans call for installing a flotation plant to produce an upgraded magnesite concentrate for dead-burning to improve the quality of the product, and for constructing a briquetting plant to process dust and return it to the kilns to ease environmental problems.

Phosphate.—In 1995, apatite concentrate production in Russia is estimated to have increased by about 6% compared with that of 1994. More than 95% of Russia's phosphate production is in the form of apatite concentrate with an average P₂O₅ content of more than 35%. Almost all of the apatite production comes from the Khibiny apatite complex on the Kola Peninsula, but some apatite concentrate is produced by the Kovdor iron ore mining complex also on the Kola peninsula. Apatite concentrate production in 1995 at Kovdor reportedly decreased to 407,300 t from 446,600 t in

1994. About 20% of Russia's apatite concentrate production was exported with about 75% of these exports going to West European countries and the remainder to former Soviet bloc countries of East Europe.

Potash.—Russian potash production in 1995 is estimated to have increased by about 12% compared with that of 1994. Russian exports of potash also increased in 1995 to almost 2.2 Mt compared with 1.9 Mt in 1994.

This production increase reversed a steady decline in potash production that had been occurring since the breakup of the FSU. The decline was attributed in large measure to the economic effects of the transitional period that resulted in agricultural producers lacking funds to purchase potash and the Government being unable to provide credit for fertilizer purchases. Russian potash production is based on the exploitation of the Verkhne Kamsk deposit in the Ural Mountains by two enterprises, the Uralkaliy and Silvinit enterprises.

Salt.—Russian salt production increased by 25% in 1995 compared with that of 1994, with the country's salt production starting to increase after having fallen from 4.1 Mt in 1991 to 2.0 Mt in 1994. Capacity utilization at Russian salt mines had fallen from more than 90% in 1991 to less than 50% in 1995.

The majority of Russia's salt production occurred from mines in the Caspian basin. The fall in production was attributed to a lack of capital for maintaining mines and equipment. Although Russia's past salt consumption had reached a peak of 9.5 Mt/yr in the Soviet period, demand for salt had fallen sharply as Russian economic activity decreased. Russia traditionally imported a large percentage of its salt requirements from Ukraine and other FSU states, but imports too have fallen. A 1992 program designed to increase Russia's salt production to between 7 Mt/yr and 7.3 Mt/yr in 1997 had not been implemented.

Soda Ash.—Production of soda ash in 1995 reportedly increased by about 14% compared with 1994. Russia has five of the FSU's eight soda ash plants, with three of these five plants using a technology based on processing nepheline and the remaining two using the Solvay process. The total plant capacity for these five plants exceeds 4 Mt; nepheline-based plants account for 15% of the total capacity. The nepheline-based plants were constructed during the Soviet period when the Soviet Union developed its nepheline resources for its aluminum industry in order to not be dependent upon imported bauxite. Although processing nepheline into alumina is more expensive than processing bauxite, the country set self-sufficiency rather than cost as its priority. However, in the production of soda ash, the nepheline-based plants have an attractive feature of yielding almost no effluents. [For a more detailed description of the soda ash industry of the FSU and the use of the nepheline process, refer to a paper by C. Watts-Jones, Chem Systems Ltd. London, U.K. entitled "Former USSR Soda Ash, Production and Patterns of Demand in a Global Context",

presented at the 12th Industrial Minerals Congress].

Mineral Fuels

Coal.—Russian coal production in 1995 decreased by more than 3% compared with that of 1994, with output falling 30% in the Moscow basin, 19% in the Urals fields, 13% in the Kansk-Achinsk basin, 8% in the Donets basin, and 2% in the Pechora basin. However, coal output increased by 14% in the Khakassia Republic, 4% in the Russian Far East, and 2% in the Chita region. Coal production remained at its 1994 level in the Kuznetsk basin, Russia's main coal-producing region. According to preliminary data, in 1995, Russia reported importing 19,430,400 t of hard coal, of which 18,402,000 t came from the CIS. Russian coal exports reportedly increased in 1995 by 22.6% compared with that of 1994 to 29.6 Mt with exports to countries outside the CIS comprising 21.1 Mt of the total.

Natural Gas.—In 1995, Russian natural gas production decreased by about 2% compared with 1994. Although production in most Russian mineral sectors fell sharply following the breakup of the Soviet Union, Russia was better able to maintain natural gas production, with production in 1995 having decreased only 7% from a high of 642.9 billion cubic meters (m³) in 1991. Russian production of liquefied petroleum gas (LPG), however, had fallen sharply, decreasing from 8.02 Mt in 1991 to 4.95 Mt in 1995.

In 1995, Russia reported producing almost 8.5 Mt of unstable gas condensate, which includes LPG, natural gasoline, and condensate. The western Siberia oil and gas complex produces about 60% of Russia's condensate output. Western Siberian condensate reportedly is highly valued because it is sulfur and mercaptan free and contains 80% to 90% light hydrocarbons.

Russia's Gazprom concern, a joint-stock company controlling natural gas production, processing, and transportation, still maintained the monopoly control over the Russian gas sector exercised by the former U.S.S.R. Ministry of Natural Gas. Gazprom produces almost 95% of Russia's total natural gas production, with the remaining output coming from casing head gas from the oil sector.

West Siberia accounts for more than 90% of the country's natural gas output. In 1995, production in West Siberia decreased by 2% at Gazprom's fields, and there have been sharp decreases in the production of casing-head gas in West Siberia because of declining oil production. Decreased natural gas output was also reported in the Orenburg region in the Urals. However, natural gas production in 1995 increased in a number of Russia's other producing regions, including a 21% increase reported in the Astrakhan region, an 11% increase in the Sakhalin region, and a 2% increase in the Yakut-Sakha Republic.

Russia possesses more than 85% of the FSU's natural gas reserves, with reportedly 48 to 49 trillion m³ of reserves in

the A,B,C₁ categories deemed “proven” reserves of commercial grade. Total potential gas resources reportedly exceed 200 trillion m³. Almost one-half of Russia's prospective area for natural gas development lies offshore on the Continental Shelf or in internal seas. Russia's proven natural gas reserves are heavily concentrated in one region, northern Tyumen Oblast in West Siberia, with 80% of the country's proven reserves.

Russia has continued to export natural gas to consumers in the other FSU countries, in the former East bloc, and in Western Europe. Russia reported exporting a total of 192.2 billion m³ of natural gas in 1995, which was a 4.3% increase compared with that of 1994. Russia exported 121.9 billion m³ outside the CIS, which was an 11.2% increase compared with that of 1994, and 70.3 billion m³ to CIS countries.

Exports of natural gas to FSU countries had fallen since the breakup of the Soviet Union owing to both decreased economic activity in this region and to the inability of these countries to pay for imported gas. Reportedly total indebtedness to Gazprom from Ukraine, Belarus, Moldova, and the Baltic states for the first 9 months of 1995 totaled between 15 and 16 trillion rubles, which was about the same amount Gazprom was owed by domestic consumers in Russia. The price Russia had been charging the FSU countries was less than the world market price, but much more than under the former Soviet subsidized price structure. The FSU countries had been paying for Russian gas in either hard currency, rubles, or barter trade in goods and services.

Exports of natural gas during this period have also fallen to former bloc countries of East Europe, while natural gas exports have increased to West Europe. Russian exports of LPG to both the FSU and the rest of the world had fallen sharply from 2.1 Mt in 1994 to 850,000 t in 1995. This fall in exports for LPG coupled with the fall in domestic consumption was reportedly causing great financial hardship for the gas processing sector.

Oil Shale.—In 1995, Russia's producer of oil shale, the Lenigradslanets mining company, reportedly produced 2.3 Mt of oil shale. The company's main customer was the Baltic powerplant in Narva, Estonia.

Petroleum.—In 1995, production of oil and gas condensate decreased by about 3% compared with that of 1994, with production decreasing by 5% in Tyumen Oblast, West Siberia, which accounts for over 65% of Russia's total output. Production increases were reported in several regions, including a 30% increase in the Vologograd and Archangelsk regions, a 6% increase in Tatarstan, and a 3% increase in the Perm region. Joint ventures reportedly produced 17.8 Mt of oil in 1995, which was an increase over 1994 joint-venture production of 14.7 Mt. Refinery output from primary crude oil fell by 2% in 1995 compared with that of 1994 to 183 Mt, but the refineries were able to upgrade their product mix, producing more light petroleum products and lubricating oils while reducing output of boiler fuel.

Total Russian exports of crude oil were reported to be 110.9 Mt. Of total Russian crude oil exports, about 16% was exported to FSU countries and another 14% to former Soviet bloc countries of East Europe and Cuba.

In 1995, total Russian exports of petroleum products decreased by 6.3% compared with that of 1994 to about 45 Mt, of which more than 10% went to countries of the FSU and under 3% to former Soviet bloc countries of East Europe, Cuba, and Mongolia.

In 1995, the trend continued of increasing oil shipments to world markets outside the FSU as domestic and FSU consumers were often unable either to make timely payments or pay in hard currency for oil.

Uranium.—Russia had one uranium mining operation, the Priargusnkiy mining and chemicals association based in Krasnokamesnk in the Transbaikal region of Chita Oblast. It produced about 3,000 t/yr of uranium concentrate (U content) and planned to raise this amount to 4,500 t/yr. Priargusnkiy reportedly was holding discussions with foreign firms to create a partnership to expand production. The Russian nuclear power industry reportedly needed about 7,000 t/yr of concentrate.

Reserves

Russia used the Soviet reserve classification system which was not the same as that used in the United States. According to the Soviet classification system, approved in 1982, deposits of all solid mineral materials are classified under two cross-imposed systems, one relating to the reliability of information on the quantity of material in place and the other relating to the economic viability of this material.

The classification system relating to the reliability of information on the quantity of material in place assigns each occurrence to one of seven categories—the reserve base categories A, B, C₁, and C₂, and the prognosticated resource categories P₁, P₂, and P₃.

According to the Soviet classification system, the reserves base for all solid mineral raw materials is divided into the explored or proven “razvedannye”—A+B+C₁ categories—and the perspective “pespektivnyye”—C₂ category. The three prognosticated resource categories, “prognoznyye resursy”, correspond to the western term “undiscovered resources.”

Under the other part of the cross-imposed system, the Soviets separated the four reserve base categories into one of two categories, “balansovyye” or “zabalansovyye.” The former word literally translated means balance, indicating that materials so classified are economically suitable for exploitation. The other category “zabalansovyye,” translates literally as beyond balance, implying that materials so classified are not regarded as economically suitable for present exploitation.

The “balansovyye” material in categories A, B, C₁, and C₂ were considered economic reserves by the Soviets. However

material regarded as economic reserves in these categories may not correspond to the western concept of economic reserves (i.e., material economically exploitable under present market prices with existing technology). Although only the “balansovye” material was considered an economic reserve, the Soviet system often referred to all materials in categories A, B, C₁, and C₂ as reserves “zapasy”. Also, despite these definitions, in the FSU a number of other terms are used to describe reserves including industrial reserves and commercial reserves, with the meaning of these terms having to be interpreted in the context of their usage and the Soviet reserve classification system.

Mining and construction of mining enterprises and the appropriate capital investment were authorized in the U.S.S.R. on the basis of the economic “balansovyye” reserves in place in categories A + B + C₁, which had to be in prescribed ratios. The “balansovyye” C₂ reserves provided a general perspective for the development of mining enterprises, but did not constitute a justification for project planning.

The four reserve base categories (A, B, C₁, and C₂) are based on data obtained from an exploration grid of prescribed density (or its equivalent) and on certain types of chemical and other tests conducted according to regulations. Density of the grid in each of these categories is different for different kinds of ore and for four different types of ore bodies.

Oil and gas reserves are classified according to a similar letter system using the A, B, C₁, and C₂ categories for the reserve base and the categories C₃, D₁, and D for the prognosticated resources. Categories and the criteria for development are similar to those for other minerals except they are based on the specific characteristics of oil and gas deposits.

Although Russia occupies over three fourths of the territory of the FSU and has a large part of its proven mineral reserves, reserves, nevertheless were distributed across the FSU in an uneven manner whereby certain reserves were disproportionately concentrated in specific countries.

Regarding the distribution of reserves in the FSU, for nonferrous metals Russia reportedly possesses 77% of the FSU's bauxite, 53% of its copper, 34% of its lead, 48% of its zinc, 95% of its nickel, 91% of its tin, 40% of its tungsten, and 42% of its molybdenum. For ferrous metals, Russia possesses 60% of the iron ore reserves of the FSU, but only 2.2% of the chromite and 4.7% of the manganese reserves. The distribution of industrial minerals is also uneven. For example, Russia possesses 34% of the fluorspar reserves of the FSU, 58% of the graphite reserves, 69% of the potash reserves, and 46% of the table salt reserves. One of Russia's major areas of strength is its fuel reserves as Russia possesses 70% of the coal reserves as well as the majority of the oil and gas reserves of the FSU. Another major area of strength for Russia is its reserves of precious metals and stones, with Russia possessing large reserves of gold and

silver and almost all the reserves in the FSU of platinum-group metals, diamonds, and rubies.

Despite large quantities of explored reserves, according to assessments of the Russian Committee for Geology and the Utilization of Natural Resources (Roskomnedr), between 30% to 70% of Russia's explored reserves of a wide range of minerals would not be economic to develop at current world prices using the mining methods from the Soviet period. According to Roskomnedr, Russia has to introduce state-of-the-art mining technologies such as heap leaching and solution mining to economically exploit many of these reserves.

The depth of reserves at mining enterprises averages 600 meters (m) for ferrous metals and 500 m for nonferrous metals. However, at a number of enterprises reserves are at a depth of more than 1,000 m and in the future may go as deep as 1,500 to 2,000 m. Already one-third of copper reserves; practically all cobalt and nickel reserves, a significant portion of lead and zinc reserves; and the majority of bauxite, high quality iron ore, and phosphate reserves are at a depth of more than 1,000 meters.

All of the countries of the FSU, including Russia, are now in need of methodologies to assess their mineral reserve data in terms of market economy criteria. The Soviet reserve classification system was not based on market economy production costs, which could not be determined using the Soviet system of central planning and fixed prices.

Although Russia has a number of world-class mineral deposits, owing to the development of its mineral industry under the Soviet central planning system that did not account for costs as would a market economy system, a significant percentage of developed deposits and processing facilities are now at a disadvantage as they try to compete for world markets. A representative of the Russian Metallurgy Committee stated that developed deposits in Russia compared to foreign deposits had an average metal content of lead-zinc that was 2.5 times lower; of tin, 2.3 times lower; of tungsten trioxide, 2.2 times lower; and of molybdenum, 2 times lower. A number of enterprises mining these low grade deposits were on the verge of bankruptcy with some already bankrupt. Many mining enterprises in order to survive were selectively mining their high-grade ore to the apparent detriment of their longer term future. In Addition to the problems of low-grade deposits, the level of geological prospecting in Russia had fallen by about 50% since 1990.

Infrastructure

Russia had a total of 154,000 km of rail lines, of which 67,300 km were only for servicing specific industries; 9,343,000 km of highway, of which 209,000 km is hard unpaved; more than 100,000 km of navigable inland waterways; about 48,000 km of crude oil pipelines and 15,000 km of product pipelines; and 140,000 km of natural gas pipelines.

Russia had the longest coastline of any country, with more than 15 seaports, including Arkhangelsk, Kaliningrad, Murmansk, Nakhodka, Novorossiysk, Vladivostok, and others and a large number of inland ports, including Astrakhan, Kazan, Khabarovsk, Krasnoyarsk, Kuybyshev, Moscow, Nizhniy-Novgorod, Rostov, and Volgograd. The greater portion of the seacoasts, however, is in sparsely populated or uninhabited regions along the Arctic Ocean. There are only a few good natural ports, and year-round access to the open seas is available only along the temperate coast in the extreme northwest.

Russia faces the problem of depleting older deposits in areas with developed infrastructure, while new deposits are in remote eastern and northern areas with severe climates and lack of infrastructure. Despite the statistics quoted on Russia's extensive transportation network, the country has no cross-country road system and practically no developed road networks in most of the northern and northeastern portions of the country. Furthermore, most of the rail network is concentrated in the western part of the country. There are only two rail lines transversing the eastern part of the country, the trans-Siberian and the Baikal Amur Mainline (BAM), with the BAM only partially operational and lacking connecting lines to areas of potential mineral development. Air transportation plays a vital role in passenger and industrial transport owing to the vast distances and the lack of other transport means.

In some eastern and northern parts of the country, the Russians relied on a combination of road, rail, river, and sea for minerals transport. Also, the Soviets developed a number of deposits depending primarily on air transport for freighting supplies and shipping minerals. For oil and gas, the Soviets had developed extensive pipeline networks that are now in great need of expensive maintenance and repair.

Outlook

The mining and metallurgical industries of Russia are in need of investment to maintain and modernize facilities,

develop new mines and processing plants, and improve worker safety and pollution controls. During the Soviet period, the mining and metallurgical sector lacked the state-of-the-art technology and pollution controls of mineral industries in advanced market economy economies. Then the economic downturn following the breakup of the Soviet Union exacerbated this situation because there was a sharp curtailment of investment needed to maintain mines, processing plants, transport networks, and other infrastructure. Output in all sectors could be greatly increased if new investment funds were available to ensure needed upkeep and provide state-of-the-art technology. However, assessments would have to be made in terms of market economy criteria as to where to profitably direct such investment.

Merely to maintain its mineral base for ferrous and nonferrous metals, according to the Russian Metallurgy Committee, Russia needs to invest 26 trillion rubles (roughly \$5.6 billion at the exchange rate at the time of this statement) in new mining capacity to maintain current output. Of this amount, only from one-fifth to one-half of the needed amount it was believed could be raised by the Russian mining industry. Therefore, the future development of Russia's mineral resources will depend on Russia ascertaining its reserves using market economy criteria and on Russia creating a political, financial, and legal climate for attracting long term investment in its mineral industry.

Many mineral products, although produced in large quantities, do not meet Western technical specifications. Many of these problems could be eliminated with investment in equipment and training of personnel. Besides being concerned with problems of meeting technical specifications, Western consumers are concerned with the ability of Russia's mineral industries to maintain quality control and to be able to supply materials on schedule. If problems of meeting technical standards, quality control, and reliability of supply were resolved, FSU mineral industries could become highly competitive in a large number of markets from which they are now excluded because of these problems.

TABLE 1
RUSSIA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Thousand metric tons unless otherwise specified)

Commodity	1992	1993	1994	1995
METALS				
Aluminum:				
Ore and concentrate:				
Bauxite, 26% to 57% alumina	4,580 2/	4,260 2/	3,000	3,100
Nepheline concentrate, 25% to 30% alumina	1,500	1,390 2/	1,300	1,400
Metal, smelter: primary 2/	2,718 2/	2,500	2,254 2/	2,600
Antimony, mine output, SB content tons	2,730	2,820	2,669	2,722
Arsenic, white do.	10,000	8,000	7,000	7,000
Beryllium, beryl, cobbled, 10% to 20% BeO do.	2,500	2,000	1,500	1,500
Bismuth, mine output, Bi content do.	1,100	800	800	800
Cadmium metal, smelter do.	5	4	4	5
Chromium, chrome ore, marketable 2/ do.	800	700	600	725
Cobalt:	121,000	121,000	151,400	107,700
Mine output, recoverable Co content do.	4,000	3,300	3,900	4,000
Metal, refinery 2/ do.	4,100	3,700	4,340	4,450
Copper:				
Ore, Cu content, recoverable 2/ do	698,500	583,600	573,300	640,000
Metal				
Blister:				
Primary 2/ do	651,000	533,700	514,300	512,000
Secondary do	10,000	10,000	10,000	20,000
Refined				
Primary 2/ do	522,000	486,200	501,800	575,000
Secondary do	50,000	40,000	40,000	40,000
Gold, mine output, Au content 2/ kilograms	146,000	149,500	146,600	132,170
Iron and steel:				
Iron ore, 55% to 63% Fe 2/	82,100	76,100	73,300	78,300
Metal:				
Pig iron for steelmaking 2/	46,100	40,900	36,100	39,800
Ferromanganese	200	150	125	125
Electric furnace ferroalloys	1,100	850	800	650
Crude steel 2/	67,000	58,300	48,800	51,300
Finished rolled steel 2/	46,800	42,700	35,900	39,100
Steel pipes 2/	8,100	5,800	3,600	3,700
Lead:				
Mine output, recoverable Pb content tons	22,000	19,500	17,000	16,000
Metal, smelter:				
Primary do.	18,000	17,500	15,700 2/	15,000
Secondary do.	14,500	14,100	12,700 2/	11,500
Magnesium metal, primary do.	40,000	30,000	35,400 2/	37,500 2/
Mercury metal, including secondary tons	70	60	50	50
Molybdenum do.	10,800	10,300	7,700	8,800
Nickel:				
Mine output, recoverable Ni content 2/ do.	280,000	244,000	240,000	251,000
Nickel, products 2/ do.	245,000	184,000	180,900	201,900
Platinum-group metals:				
Platinum do.	28	20	15	18
Palladium do.	70	50	40	48
Others do.	6	4	3	4
Silver metal including secondary do.	800	700	700	700
Tin:				
Mine output, recoverable Sn content do.	16,000	14,000	12,000	10,000
Metal, smelter:				
Primary 2/ do.	15,200	13,400	11,500	9,500
Secondary do.	1,500	1,500	1,000	1,000
Total do.	16,700	14,400	12,500	10,500
Titanium, metal do.	25,000	17,000	19,500	39,000 2/
Tungsten concentrate, W content do.	13,000	10,200	5,200	7,000
Vanadium metal do.	11,000	10,000	10,000	10,000
Zinc:				
Mine output, recoverable Zn content tons	160,000	150,000	145,000	130,000
Metal:				
Primary do	185,000	200,000	137,800 2/	167,000
Secondary do	60,000	60,000	50,000	50,000

See footnotes at end of table.

TABLE 1--Continued
 RUSSIA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Thousand metric tons unless otherwise specified)

Commodity	1992	1993	1994	1995
INDUSTRIAL MINERALS				
Asbestos, grades I-VI	1,300	870 2/	615 2/	600
Barite	NA	NA	NA	NA
Cement, hydraulic 2/	61,700	49,900	37,200	36,400
Clays: Kaolin including china clay	NA	NA	NA	NA
Corundum, natural	NA	NA	NA	NA
Diamond:				
Gem	9,000	8,000	8,600	9,000
Industrial	9,000	8,000	8,600	9,000
Total	18,000	16,000	17,200	18,000
Diatomite	NA	NA	NA	NA
Feldspar	100	70	50	50
Fluorspar				
Fluorspar, concentrate 55% to 96.4% CaF ₂	100	70	50	50
Graphite	15	10	8	8
Gypsum	1,800	1,500	1,200	1,200
Lime, dead-burned	NA	NA	NA	NA
Lithium minerals, not further specified	NA	NA	NA	NA
Magnesite, marketable product	1,100	800	700	700
Mica	150	129 2/	100	100
Nitrogen, N content of ammonia	9,000	8,000	7,500	8,000
Phosphate rock:				
Apatite, concentrate, 37% to 39.6% P ₂ O ₅	11,000	9,000	8,000	8,500
Sedimentary rock, 19% to 30% P ₂ O ₅	500	400	300	300
Total	11,500	9,400	8,300	8,800
Potash, K ₂ O equivalent 2/	3,470	2,628	2,498	2,800
Pyrite, gross weight	NA	NA	NA	NA
Salt, all types 2/	3,600	2,200 2/	2,000	2,500
Sodium compounds, n.e.s., carbonate 2/	2,679	1,992	1,585	1,800
Sulfur:				
Native	100	100	80	80
Byproducts:				
Of metallurgy	250	200	150	150
Of natural gas	1,800	1,700	1,600	1,500
Total	2,150	2,000	1,830	1,730
Sulfuric acid 2/	9,700	8,200	6,300	6,900
Talc	150,000	132,000 2/	100,000	100,000
Vermiculite	60	50	40	40
MINERAL FUELS AND RELATED MATERIALS				
Coal:				
Bituminous	210,000	200,000	170,000	160,000
Lignite and brown coal	127,000	106,000	102,000	102,000
Total 2/ 3/	337,000	306,000	272,000	262,000
Coke, 6% moisture content 2/	31,000	27,600	25,400	27,600
Gas, natural, marketed, as reported 2/	641,000	618,000	607,000	595,000
Oil shale 2/	3,800	3,300	3,300	2,300
Peat, fuel use	7,800	2,500	2,900	2,900
Petroleum:				
Crude:				
As reported, gravimetric units 2/	399,000	354,000	318,000	307,000
Converted, volumetric units	2,900,000	2,600,000	2,300,000	2,250,000
Refinery products 2/ 4/	256,000	223,000	186,000	183,000
Uranium, U content	3,000	3,000	3,000	3,000

NA Not available.

1/ Table includes data available through Sept. '13, 1996

2/ Reported data.

3/ Run-of-mine coal.

4/ Not distributed by type and therefore not suitable for conversion to volumetric units. Data include all energy and nonenergy products but exclude losses.

TABLE 2
RUSSIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1995

(Metric tons unless otherwise specified)

Commodity	Major operating facilities	Location	Annual capacity e/
Alumina	Achinsk	Achinsk in East Siberia	900,000.
Do.	Bogoslovsk	Urals	1,050,000.
Do.	Boksitogorsk	European north	200,000.
Do.	Nadvoitsy	Nadvoitsy in Karelia	266,000.
Do.	Uralsk	Kamensk region	536,000.
Do.	Volkhov	Volkhov, east of St. Petersburg	45,000.
Aluminum, primary	Smelters:		
Do.	Volkhov	do.	20,000.
Do.	Uralsk	Kamensk	70,000.
Do.	Bogoslovsk	Krasnoturinsk	162,000.
Do.	Novokuznetsk	Novokuznetsk	284,000.
Do.	Kandalaksha	Kola Peninsula	62,500.
Do.	Nadvoitsy	Nadvoitsy in Karelia	68,000.
Do.	Volgograd	Volgograd	168,000.
Do.	Irkutsk	Sherekov, near Irkutsk	262,000.
Do.	Krasnoyarsk	Krasnoyarsk	755,000.
Do.	Bratsk	Bratsk	843,800.
Do.	Sayansk	Sayanogorsk	274,000.
Apatite, concentrate	Khhibiny apatit association	Kola Peninsula	15,000,000.
Do.	Kovdor iron ore mining association	do.	700,000.
Asbestos	Kiyembay	Orenburg Oblast	500,000.
Do.	Tuvaasbest	Tuva Republic	250,000.
Do.	Uralasbest	Central Urals	1,100,000.
Bauxite	North-Urals mining company	Severouralsk region	NA.
Do.	South-Urals mining company	South Urals region	NA.
Do.	Severnaya Onega mine	Northwest region	800,000.
Boron	Bor Association	Maritime region	140,000 (boric acid).
Do.	Amur River complex	Far East	8,000 (boric acid).
Do.	Alga River Chemical Complex	do.	12,000 (boric acid).
Chromite	Saranov complex	Saranov	200,000.
Coal	Basins:		
Do.	Donets (east)	Rostov Oblast	30,000,000.
Do.	Kansk Achinsk	East Siberia	50,000,000.
Do.	Kuznetsk	West Siberia	160,000,000.
Do.	Moscow	Moscow region	15,000,000.
Do.	Neryungri	Yakut-Sakha Republic	15,000,000.
Do.	Pechora	Komi Republic	30,000,000.
Do.	South Yakutia	Yakut-Sakha Republic	17,000,000.
Cobalt	Norilsk Nikel	Norilsk, Kola Peninsula	4,000.
Do.	Rezh, Ufaleynikel,	Southern Urals	4,000 (total southern Urals).
Do.	Yuzhuralnikel enterprises		
Do.	Tuva Cobalt	Khovu-Aksy in Tuva Republic	NA.
Copper, mining and beneficiation complexes (Cu content of concentrates)	Buribai Enterprise	Buribai region	5,000.
Do.	Gai Complex	Gai region	40,000.
Do.	Kirovgrad Complex	Kirovgrad region	12,000.
Do.	Krasnouralsk Complex	Krasnouralsk region	12,000.
Do.	Norilsk Complex	Norilsk region	400,000.
Do.	Sredneuralsk Complex	Ekatrinenburg region	12,000.
Do.	Uchali Complex	Uchali region	40,000.
Do.	Urap Complex	Stavropol region	7,000.
Copper, metal (smelting and refining complexes)	Kirovgrad (smelting)	Kirovgrad	150,000.
Do.	Krasnouralsk (smelting)	Krasnouralsk	60,000.
Do.	Kyshtym (refining)	Kyshtym	70000.
Do.	Mednogorsk (smelting)	Mednogorsk	40,000.
Do.	Norilsk (smelting and refining)	Norilsk	500,000.
Do.	Pyshma (refining)	Pyshma	350,000.
Do.	Severonikel (smelting)	Monchegorsk	20,000.
Do.	Sredneuralsk (smelting)	Revda	140,000.
Diamonds	thousand carats	Almazny Rossii-Sakha ssociation	Aykhal, Mirnyy, Udachnaya areas of Yakut-Sakha republic
			10,000 gem, 10,000 industrial.
Feldspar	Deposits:		
Do.	Lupikko	Karelia	NA.
Do.	Kheto-Lanbino	do.	NA.

See footnotes at end of table.

TABLE 2--Continued
RUSSIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1995

(Metric tons unless otherwise specified)

Commodity	Major operating facilities	Location	Annual capacity e/
Ferroalloys	Kosaya Gora Iron Works	Kosaya Gora	200,000.
Do.	Kuznetsk ferroalloy plant	Novokuznetsk	400,000.
Do.	Lipetsk Iron and steel works	Lipetsk	NA.
Do.	Serov ferroalloy plant	Serov	NA.
Do.	Tulachernet Scientific and Industrial Association	Tula	NA.
Do.	Chelyabinsk Electrometallurgical plant	Chelyabinsk	350,000.
Do.	Chusovoy Iron and steel plant	Chusovoy	NA.
Do.	Klyuchevsk ferroalloy plant	Dvurechinsk	160,000.
Fluorspar	Mining and beneficiation complexes:		
Do.	Abagaytuy	trans-Baikal	NA.
Do.	Kalanguy	do.	NA.
Do.	Kyakhtinsky	do.	NA.
Do.	Usugli	do.	NA.
Do.	Yaroslavsky	Far East	NA.
Gold	kilograms	Gold mining regions:	200,000 (total gold).
Do.	Yakut-Sakha	Yakut-Sakha Republic	
Do.	Buryat	Buryat Republic	
Do.	Magadan	Magadan oblast	
Do.	Krasnoyarsk	Krasnoyarsk region	
Do.	Maritime	Maritime region	
Do.	Tuva	Tuva Republic	
Iron ore	Mining areas:		
Do.	Kursk Magnetic Anomaly (KMA) containing following enterprises:		50,000,000 (total KMA).
Do.	Mikhailovka	Zheleznogorsk	
Do.	Lebedi	Gubkin	
Do.	Stoilo	do.	
Do.	Northwest containing following enterprises:		22,000,000 (total Northwest).
Do.	Olenogorsk	Olenogorsk	
Do.	Kostomuksha	Kostomuksha	
Do.	Kovdor	Kola Peninsula	
Do.	Siberia (east) containing the following mining enterprises:		18,000,000 (total Siberia east and west).
Do.	Korshunovo	Zheleznogorsk	
Do.	Rudnogorsk	Rudnogorsk	
Do.	Siberia (west) including the following mining enterprises:		
Do.	Abakan	Abaza	
Do.	Sheregesh	Sheregesh	
Do.	Tashtagol	Tashtagol	
Do.	Teya	Vershina Tei	
Do.	Urals containing following mining enterprises:		22,000,000 (total Urals).
Do.	Akkermanovka	Novotroitsk	
Do.	Bakal	Bakal	
Do.	Goroblagodat	Kushva	
Do.	Kachkanar	Kachkanar	
Do.	Magnitogorsk	Magnitogorsk	
Do.	Peshchanka	Rudnichny	
Lead-zinc (recoverable metal content of ore)	Mining complexes:		
Do.	Altay mining and beneficiation complex	Altay mountains region, South Siberia	2,000 lead, 1,000 zinc.
Do.	Dalpolymetal mining and beneficiation complex	Maritime region	20,000 lead, 25,000 zinc.
Do.	Nerchinsk polymetallic complex	Chita Oblast	7,000 lead, 12,500 zinc.
Do.	Sadon lead-zinc complex	Severo-Ossetiya	5,000 lead, 14,000 zinc.
Do.	Salair mining and beneficiation complex	Kemerovo Oblast	2,000 lead, 10,500 zinc.
Lead, metal	Dalpolymetal lead smelter	Rudnaya in the Maritime district	20,000.
Do.	Elektrozinc lead smelter	Vladikavkaz in North Caucasus	30,000.
Magnesite	Satka deposit	Chelyabinsk Oblast	3,800,000.
Magnesium, metal (for sale)	Avisma plant	Berezniki	22,000.
Do.	Solikamsk plant	Solikamsk	21,500.
Mica	Mining complexes:		
Do.	Aldan	Yakut-Sakha Republic	NA.
Do.	Karel	Karelia	NA.
Do.	Kovdor	Kola Peninsula	NA.
Do.	Mam	Irkutsk complex	NA.

See footnotes at end of table.

TABLE 2--Continued
RUSSIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1994

(Metric tons unless otherwise specified)

Commodity	Major operating facilities	Location	Annual capacity e/
Molybdenum, mining enterprise	Dzhida tungsten-molybdenum mine	West trans-Baikal	NA.
Do.	Sorsk molybdenum mining enterprise	Sorsk region	NA.
Do.	Tyrny-Auz tungsten-molybdenum mining enterprise	North Caucasus	NA.
Do.	Shakhtaminskoye molybdenum mining enterprise	Chita Oblast	NA.
Natural gas	billion cubic meters	Regions:	
Do.	Komi Republic	Komi Republic	8.0..
Do.	Norilsk area	Norilsk area	5.5..
Do.	North Caucasus	North Caucasus	6.0..
Do.	Sakhalin	Far East	2.0..
Do.	Tomsk Oblast	West Siberia	0.5..
Do.	Tyumen Oblast including:	do.	575.
Do.	Medvezhye field	do.	75..
Do.	Urengoi field	do.	300..
Do.	Vyrngapur field	do.	17..
Do.	Yamburg field	do.	170..
Do.	Urals	Urals	45..
Do.	Volga	Volga region	6..
Do.	Yakut-Sakha	Yakut-Sakha Republic	1.5..
Nepheline syenite	Apatite complex	Kola Peninsula	1,500,000.
Do.	Kiya-Shaltyr mine	Goryachegorsk region, east Siberia	NA.
Nickel, mining enterprise (Ni in ore)	Norilsk Nickel association	Norilsk region and Kola Peninsula	300,000.
Do.	Yuzhuralnikel company	Southern Urals	20,000 total southern Urals).
Do.	Ufaleynikel company	do.	Urals).
Nickel, metal (smelting and refining complexes)	Norilsk Nikel (smelting and refining)	Norilsk	160,000 (smelting), 100,000 (refining).
Do.	do.	Pechenga	50,000 (smelting).
Do.	do.	Monchegorsk	50,000 (smelting), 140,000 (refining).
Do.	Rezh, Ufaleynikel, Yuzhuralnikel enterprises	Southern Urals	65,000 (total, nickel products and nickel in ferronickel).
Oil shale	Leningradslanets association	Slantsy region	5,000,000.
Petroleum	Producing regions:		
Do.	European Russia:		
Do.	Astrakhan	Northern Caspian Sea Basin	700,000.
Do.	Bashkortostan	Urals	28,000,000.
Do.	Checheno-Ingush Republic	Southern Caucasus	4,500,000.
Do.	Dagestan	North Caucasus	700,000.
Do.	Kaliningrad Oblast	Baltic coast	1,800,000.
Do.	Komi Republic	Northwest	15,000,000.
Do.	Krasnodar Kray	North Caucasus	2,000,000.
Do.	Orenburg Oblast	Urals	13,000,000.
Do.	Perm Oblast	do.	12,000,000.
Do.	Samara	Volga region	16,000,000.
Do.	Saratov Oblast	do.	1,500,000.
Do.	Stavropol Kray	North Caucasus	2,000,000.
Do.	Tatarstan	Volga region	40,000,000.
Do.	Udmurt Republic	Urals	9,000,000.
Do.	East Siberia: Tomsk Oblast	Tomsk Oblast	11,000,000.
Do.	West Siberia:		
Do.	Tyumen Oblast:	Tyumen Oblast	300,000,000.
Do.	Kogolym field	do.	34,000,000.
Do.	Krasnoleninskiy field	do.	12,000,000.
Do.	Langepas field	do.	30,000,000.
Do.	Megion field	do.	18,000,000.
Do.	Nizhnevartovsk field	do.	70,000,000.
Do.	Noyabrsk field	do.	37,000,000.
Do.	Purneftegaz field	do.	12,000,000.
Do.	Surgut field	do.	48,000,000.
Do.	Uray field	do.	8,000,000.
Do.	Varegan field	do.	10,000,000.
Do.	Sakhalin Island	Sakhalin Island	2,500,000.

See footnotes at end of table.

TABLE 2--Continued
RUSSIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1995

(Metric tons unless otherwise specified)

Commodity	Major operating facilities	Location	Annual capacity e/ concentrate).
Phosphate rock	Khibiny Apatit association	Kola Peninsula	20,000,000 (apatite concentrate).
Do.	Kovdor iron ore mining complex	do.	700,000 (apatite concentrate).
Do.	Kingisepp complex	Leningrad Oblast	NA.
Do.	Lopatino, Yegorevsk deposits	Moscow Oblast	NA.
Do.	Polpinskoye deposit	Bryansk Oblast	NA.
Do.	Verkhnekamsk deposit	Urals	NA.
Platinum-group metals:			130 (total metal).
Ore	Norilsk Nickel association	Norilsk region	
Metals	Krasnoyarsk refinery of Norilsk Nickel association	Krasnoyarsk	
Potash, K ₂ O	Uralkaliy	Verkhne Kamsk deposit	3,000,000.
Do.	Silvinit	Solikamsk-Berezniki region of Urals	2,000,000.
Silver	Dukat mine	Magadan oblast	1,000 (total silver).
	Coproduct and byproduct of gold and nonferrous metals mining		
Soda ash	Achinsk plant	East Siberia	595.
Do.	Berezniki plant	Urals	1,080.
Do.	Pikalevo plant	Leningrad Oblast	200.
Do.	Sterlitamak plant	Sterlitamak	2,135.
Do.	Volkhov plant	Leningrad Oblast	20.
Steel, crude	Amurstal	Komsomolsk na Amur	1,600,000.
Do.	Asha	Asha	450,000.
Do.	Beloretsk	Bashkir Republic	380,000.
Do.	Chelyabinsk	Chelyabinsk	7,000,000.
Do.	Cherepovets	Cherepovets	14,000,000.
Do.	Chusovoy	Chusovoy	570,000.
Do.	Elektrostal	Moscow	314,000.
Do.	Gorky	Nizhniy-Novgorod	78,000.
Do.	Guryevsk	Guryevsk	160,000.
Do.	Karaganda	Karaganda	6,300,000.
Do.	Kuznetsk	Novokuznetsk	4,700,000.
Do.	Lipetsk	Lipetsk	9,900,000.
Do.	Lysva	Lysva	350,000.
Do.	Magnitogorsk	Magnitogorsk	16,200,000.
Do.	Nizhniy Tagil	Nizhniy Tagil	8,000,000.
Do.	Nizhniy Sergi	Nizhniy Sergi	300,000.
Do.	Novosibirsk	Novosibirsk	1,100,000.
Do.	Omutninsk	Omutninsk	210,000.
Do.	Orsko-Khalilovo	Novotroitsk in Orenburg Oblast	4,600,000.
Do.	Oskol Electric Steel	Stary Oskol	1,450,000.
Do.	Petrovsk-Zabaikalskiy	Petrovsk-Zabaikalskiy	426,000.
Do.	Revda	Revda	281,000.
Do.	Salda	Sverdlovsk Oblast	1,900.
Do.	Serov A.K.	Serov	1,000,000.
Do.	Serp i Molot	Moscow	70,000.
Do.	Severskiy	Polevskoy in Sverdlovsk Oblast	825,000.
Do.	Sibelektrostal	Krasnoyarsk	110,000.
Do.	Sulin	Sulin	280,000.
Do.	Taganrog	Taganrog	925,000.
Do.	Tulachermet-Scientific and Industrial Association	Tula	18,400.
Do.	Verkh-Issetskiy	Ekatrinenburg	132,000.
Do.	Volgograd	Volgograd	2,000,000.
Do.	Vyksa	Vyksa	540,000.
Do.	West Siberian	Novokuznetsk	6,900,000.
Do.	Zlatoust	Zlatoust in Chelyabinsk Oblast	1,200,000.
Talc	Deposits:		
Do.	Onotsk	Irkutsk Oblast	NA.
Do.	Kirgiteysk	Krasnoyarsk Kray	NA.
Do.	Miass	Chelyabinsk Oblast	NA.
Do.	Shabrovsk	Sverdlovsk Oblast	NA.
Tin, mining and beneficiation complexes	Khingan	Khabarovsk Kray	NA.
Do.	Solnechnyy	do.	NA.
Do.	Iultin	Magadan Oblast	NA.
Do.	Khrustalnyy	Maritime region	NA.
Do.	Deputatskiy	Yakut-Sakha Republic	NA.
Do.	Pevek	Magadan oblast	NA.

See footnotes at end of table.

TABLE 2--Continued
 RUSSIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1995

(Metric tons unless otherwise specified)

Commodity	Major operating facilities	Location	Annual capacity e/
Tin, smelters	Novosibirsk	Novosibirsk	NA.
Do.	Podolsk	Podolsk	NA.
Do.	Ryazan	Ryazan	NA.
Titanium, metal	Berezniki plant	Berezniki	40,000.
Do.	Moscow plant	Moscow	NA.
Do.	Podolsk plant	Podolsk	NA.
Tungsten, mining and beneficiation complexes (W content of concentrates)	Antonovogorsk	East Transbaikal	NA.
Do.	Balkan	Urals, northeast of Magnitogorsk	NA.
Do.	Belukha	East trans-Baikal	NA.
Do.	Bom-Gorkhom	West trans-Baikal	NA.
Do.	Dzhida	do.	NA.
Do.	Iul'in	Magadan Oblast	NA.
Do.	Lermontov	Maritime region	NA.
Do.	Solnechnyy	Southern Khabarovsk region	NA.
Do.	Tyrnyauz	North Caucasus	NA.
Do.	Primorye	Maritime region	NA.
Tungsten, metal	Nalchik plant	Caucasus	NA.
Uranium, U content	Priargunskiy mining and chemical enterprise	Krasnokamensk	3,000.
Vanadium, ore	Kachkanar iron ore mining complex	Urals	NA.
Vanadium, metallurgical processing facilities	Chusovoy plant	do.	17,000 (total metal).
Do.	Nizhniy Tagil plant	do.	
Zinc (nonassociated with lead), metal content of ore	Bashkir copper-zinc complex	Sibai in southern Urals	5,000.
Do.	Buribai copper-zinc mining complex	Buribai in southern Urals	1,500.
Do.	Gai copper-zinc mining and beneficiation complex	Gai in Southern Urals	25,000.
Do.	Kirovgrad copper enterprise	Kirovgrad in central Urals	1,200.
Do.	Sredneuralsk copper complex	Revda in central Urals	5,000.
Do.	Uchali copper-zinc mining and beneficiation complex	Uchali in southern Urals	90,000.
Zinc, metal	Chelyabinsk electrolytic zinc plant	Chelyabinsk	190,000.
Do.	Elektrozink plant	Vladikavkaz in North Caucasus	100,000.

e/Estimated. NA Not available.